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FEDERAL COMMUNICATIONS COMMISSION
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Before The
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of:

Amendment of the Commission's)	
Rules to Establish Rules and)	
Policies Pertaining to a Mobile)	CC Docket No. 92-166
Satellite Service in the)	
1610-1626.5-2500 MHz)	
Frequency Bands)	

REPLY COMMENTS OF MOTOROLA SATELLITE COMMUNICATIONS, INC.

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SUMMARY

The initial comments to the Commission's Notice of Proposed Rulemaking ("NPRM") demonstrate an impressively broad consensus by a diverse group of parties and interests on at least the general framework of the proposed rules. The Commission should seize the moment and expeditiously adopt the rules proposed in the NPRM with certain minor modifications. The few isolated and unjustified criticisms leveled at the NPRM by some parties should not be allowed to sidetrack the debate and further delay the domestic licensing process, which has already taken several years. In light of the innumerable public benefits to be gained as a result of the initiation of the proposed Big LEO Mobile Satellite Service systems ("Big LEO MSS systems"), it is U.S. consumers and the U.S. economy that would suffer from any unnecessary regulatory delay.

The record compiled in this proceeding amply supports the Commission's conclusion that only systems employing a low-Earth orbit ("LEO") architecture should be eligible to provide MSS in the 1610-1626.5 MHz and 2483.5-2500 MHz bands (the "Big LEO MSS bands"). This eligibility threshold is justified in light of the unique potential of Big LEO systems for global service and is necessary to realize the Commission's vision of a Global Information Infrastructure. Allowing use of the Big LEO MSS bands by regional systems would squander the hard-won

international MSS allocations of the bands and betray the aspirations of the under-served developing countries that were instrumental in securing those allocations at the 1992 World Administrative Radio Conference.

The Commission should endorse the proposed spectrum sharing plan, which ensures that all qualified applicants will receive licenses. It is largely based on the plan jointly proposed by three of the Code Division Multiple Access ("CDMA") applicants, and, in fact, sets forth a more generous unconditional assignment for the CDMA modulation than contemplated in that joint proposal. To dismiss the unfounded allegation that the Commission's plan favors the Frequency Division Multiple Access/Time Division Multiple Access ("FDMA/TDMA") applicant, the Commission need only consider that the FDMA/TDMA assignment amounts to less than a sixth of the aggregate Big LEO MSS bands, and possibly less than a fifth of the uplink and downlink spectrum that the CDMA applicants would be allowed to use.

The Commission should definitively provide for an equal split of the 1610-1626.5 MHz band in the very likely event that only one CDMA and one FDMA/TDMA system become operational, and should remove the inequitable requirement that the FDMA/TDMA licensee demonstrate need for any additional spectrum. Anything short of a 8.25 MHz/8.25 MHz split in such a situation would unjustifiably handicap the FDMA/TDMA licensee vis-à-vis its competition and would fail to accomplish any meaningful new entry.

Nor should the Commission consider the adoption of any interim band plan. It is reasonable to assume that there will be no need for an interim plan since all indications are that the Russian GLONASS system will move down in frequency. In any event, it does not appear that the FAA plans to rely on GLONASS to augment the GPS for approach and ground navigation.

High threshold qualification standards are also necessary to ensure the prompt delivery of service. The Commission should refrain from relaxing the proposed global service and financial qualification requirements. The relaxation suggested by some parties would risk undermining the objective of truly global service and allow for the construction of regional systems or systems otherwise incapable of global service.

On the other hand, it is imperative that the Commission adopt the realistic out-of-band "mask" proposed by Motorola, which would equitably resolve the question of out-of-band emissions across the boundaries of the Big LEO MSS bands and protect the systems operating in the CDMA and FDMA/TDMA assignments within those bands. Absent the adoption of this mask, there would be a substantial loss of capacity for all systems.

Finally, the Commission should squarely hold that the provision of bulk space segment capacity by Big LEO MSS system operators is not common carriage. This conclusion is mandated by a straightforward application of the applicable legal standards as well as by strong policy considerations.

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REPLY COMMENTS OF MOTOROLA SATELLITE COMMUNICATIONS, INC.

Motorola Satellite Communications, Inc. ("Motorola") hereby submits its Reply Comments in the above-captioned proceeding. At the outset, Motorola notes that most of the rules proposed and compromises struck in the Commission's Notice of Proposed Rulemaking ("NPRM") have justifiably garnered strong support, at least in principle, from many commenting parties. This widespread support underscores Motorola's earlier view that any modifications to the proposed rules are mostly in the nature of fine-tuning. In that spirit, Motorola subscribes to some of the suggestions made by other parties and submits that the Commission should implement these changes in addition to those recommended in Motorola's initial Comments. On the other hand, the few isolated criticisms of the Commission's proposals are unreasonable on their face and must be rejected.

I. TECHNICAL QUALIFICATION STANDARDS

- A. The Commission's LEO Architecture Requirement is Compelled by the Public Interest in Global Service and the U.S. International Telecommunications Policies

The comments from a broad range of parties confirm the wisdom of the low-Earth orbit ("LEO") architecture requirement proposed by the Commission. See Comments of the American Red Cross, the African-American Institute, Honeywell Inc., Southern California Edison Company, Apogee Services, Inc., TRAVELWORLD, Inc., Crow Associates, Mathis & Associates, Dr. Raymond V. Akwule; Comments of TRW Inc. ("TRW") at 20-25; Comments of Loral/Qualcomm Partnership, L.P. ("LQP") at 11-19; Comments of Constellation Communications, Inc. ("Constellation") at 5-8; Comments of Ellipsat Corporation ("Ellipsat") at 17-20. The solitary and self-serving opposition of AMSC Subsidiary Corporation ("AMSC") is unpersuasive and does not cast any doubt on the Commission's determination that the public interest mandates a LEO architecture requirement for the spectrum under consideration in this proceeding.

1. Geostationary Systems Cannot Provide Truly Global Mobile Satellite Service

In their initial comments, all of the LEO applicants as well as several other parties discussed the enormous benefits that LEO systems will be able to offer to the public, including their unique capability for providing truly global MSS. These parties further demonstrated that such benefits could not be fully realized if the Commission were to allow use of the global

MSS spectrum by geostationary systems. See, e.g., LQP Comments of 11-19; TRW Comments at 20-25; Constellation Comments at 5-8; Ellipsat Comments at 17-20. Not surprisingly, one commenting party -- AMSC -- alleges that the capabilities of an "optimal" geostationary system could provide "near-total" coverage of the globe. See Comments of AMSC at 21 et seq. It is a matter of simple geometry, however, that a substantial part of the world will always remain out of reach from satellites in geosynchronous orbit, regardless of how many satellites are employed.^{1/} This inescapable constraint belies AMSC's claim that even an "optimal" geostationary system could satisfy the Commission's proposed service requirements. Certainly, nothing near this global capability can be offered by AMSC's planned geostationary system, which would serve, at most, the United States and surrounding areas.^{2/}

AMSC's position, if adopted by the Commission, would promote discrimination between the areas of the world populated by the "haves" and those inhabited by the "have nots." For example, AMSC makes much of the purported ability of geostationary systems to focus their beams on the most populated areas of the world -- or more likely on those areas where demand is the heaviest. AMSC Comments at 21. It is precisely this

^{1/} For example, as TRW points out, AMSC's planned system covers less than half the state of Alaska with an elevation angle of 5° or better. TRW Comments 19-20 (citing AMSC Prospectus at 2 (Nov. 22, 1993)). See also infra.

^{2/} Contrary to AMSC's characterization, INMARSAT's geostationary system is not truly global because, among other reasons, it is constrained by the geosynchronous orbit.

focus that would perpetuate the distinction between developed and developing countries with respect to the enjoyment of sophisticated telecommunications services. See Speech of Reed E. Hundt to World Telecommunication Development Conference (Mar. 22, 1994) ("Hundt Buenos Aires Address") (attached as Appendix 4 to Motorola's initial Comments), at 2. The need for MSS services may well be more immediate in sparsely populated regions of the world than in densely populated and affluent areas, which are more likely to have access to a range of alternative modes of personal communications.

Nor should the Commission accept AMSC's unsupported claims that geostationary systems would focus initially on "relatively wealthy, high-demand regions" and then expand their services to other less populated regions. See AMSC Comments at ii. Basic economics suggest that absent sufficient demand to justify substantial additional investment, lesser populated regions of the world would never realize the benefits of MSS from geostationary systems. By contrast, the infrastructure of a LEO system will be available in all areas of the world without need for significant incremental investment. Global MSS could be provided by LEO systems irrespective of whether the demand from any particular region is sufficient to justify the investment in an existing system.^{3/}

^{3/} As an example of possible incremental GSO expansion to under-developed countries, AMSC cites the expansion of VSATs from the U.S. to Europe and Asia. AMSC Comments at 23. Naturally, however, serving Switzerland and Japan will do little to remedy the "tragic" inequities in the availability of telecommunications services identified by Chairman Hundt in less developed countries. See Hundt Buenos Aires Address at 20.

A number of prospective MSS users indicated in their initial comments that they needed handheld satellite telephone, not vehicle-mounted telephones, in connection with their activities. See, e.g., Comments of the American Red Cross, the African-American Institute, Honeywell Inc., Southern California Edison Company, Apogee Services, Inc. TRAVELWORLD, Inc., Mathis & Associates. Such services cannot be provided by geostationary systems such as AMSC. Current limitations on geostationary system designs limit those systems to providing service to less portable subscriber equipment than handheld devices. As TRW points out, citing the application of Personal Communications Satellite Corporation (an AMSC affiliate) filed April 7, 1994, even next generation geostationary systems will require "vehicular boosters" into which subscribers will need to plug their portable units when travelling. See Personal Communications Satellite Corporation, Application for Authority to Construct a Domestic Communications Satellite System for the Provision of Mobile Satellite Service, File Nos. 24-DSS-P-94 and 25-DSS-P-94 (filed April 7, 1994), at 20; see also TRW Comments at 19. By comparison, all of the LEO MSS proponents indicate that they will serve primarily handheld personal devices.

2. AMSC Does Not Plan to Provide Global Service

Whatever the claimed capabilities of an optimal hypothetical GSO system for "near-total" coverage, AMSC freely concedes that it would "operate only in North America." AMSC Comments at 33. AMSC couches the prospect of any service beyond

North America in the most speculative terms ("perhaps in the long term through participating in the provision of service in other regions"). Id. at 20. For all the reasons recounted in Motorola's initial comments, the Commission should not allow such valuable international MSS allocations to be squandered by a system that does not plan to provide global MSS.

3. AMSC's Need for More MSS Spectrum is Speculative and Unsupported

AMSC's asserted need for more spectrum in the 1616.5-1626.5 MHz band is undocumented and speculative at best. It already enjoys an exclusive license for 30 MHz of L-band spectrum (1544-1559/1645.5-1660.5 MHz), and concedes that it expects to get access to at least 20 MHz of L-band spectrum after international coordination. See SEC Form S-1 Registration Statement of American Mobile Satellite Corp., Amendment No. 2, at 13 (Dec. 10, 1993). This amount of spectrum is far in excess of the proposed assignments to the FDMA/TDMA Big LEO system.

AMSC also claims that it needs more MSS spectrum for the "full development" of its system and because its "market research indicates that demand for AMSC's services is likely to exceed its capacity by 1998," just two to three years after its system is now scheduled to become operational.^{4/} AMSC Comments

^{4/} It has recently been reported that AMSC's first satellite launch will be further delayed into 1995. See Communications Daily, May 3, 1994, p. 5 (AMSC "plans to launch commercial mobile satellite system next year"); Communications Daily, June 14, 1994, p. 7 (launch of AMSC's first satellite rescheduled for last 2 weeks in March 1995; "AMSC said that despite work on new antenna design it couldn't assure that satellite would be
(continued...)

at 6. Yet AMSC further explains that its interest in the 1.6 GHz band "has been principally . . . to add capacity to its second and third satellites." Id. AMSC has not even begun to construct those satellites despite having missed its construction milestones by several years. The Commission must not allow AMSC to continue to warehouse these licenses or assign to AMSC additional spectrum until it can convincingly demonstrate a need for more spectrum.

4. AMSC's Ability to Employ the 1.6/2.4 GHz
MSS Bands is Questionable

AMSC maintains that the ability of the LEO systems to provide MSS in accordance with the Commission's proposed standards is speculative. See AMSC Comments at 27. It is AMSC's own ability to use this spectrum that is questionable. Even though AMSC claims that the 1616.5-1626.5 MHz band can be added to its second and third satellites "at a nominal cost of as little as \$1 million," AMSC Comments at 6, it has filed a lengthy succession of applications to extend its milestones for commencing construction of those two satellites.^{4/} As grounds for the requested extensions, AMSC has cited the uncertainty about

^{4/} (...continued)
available for March flight period or that appropriate alternative launch period could be secured if it were postponed again").

^{5/} Motorola has petitioned the Commission to deny AMSC's requests for milestone extensions and declare the authorizations for AMSC-2 and AMSC-3 null and void. Application of AMSC Subsidiary Corporation for Authority to Extend the Milestone Dates for Commencement of Construction of the AMSC-2 and AMSC-3 Satellites, File Nos. 13/14 DSS-AMEND-94, Petition to Deny of Motorola Satellite Communications, Inc. (filed Mar. 17, 1994).

the need to make this allegedly inexpensive addition to its satellites. See Letter of AMSC Subsidiary Corp., File Nos. 13/14 DSS - AMEND-94, at 2 (dated Jan. 27, 1994) ("The principal reason an extension is needed for construction of the second and third satellites is that there remains too much uncertainty regarding the spectrum available for the U.S. MSS system

[Q]uestions remain as to how much spectrum may be available to AMSC . . . for the second and third satellites, and what design modifications might be needed to use such spectrum"). These repeated extension requests, on the basis of a design change that AMSC now alleges to be minimal, cast serious doubt on AMSC's willingness and/or ability to meet the Commission's proposed strict milestones for MSS systems in this band.

Furthermore, AMSC has no concrete plans for downlink frequencies to match the 1616.5-1626.5 MHz uplink band. The Commission has already rejected AMSC's primary downlink at 1.5 GHz, and AMSC only expresses vague "preparedness" to use the 2.4 GHz band as a non-optimum alternative if necessary. AMSC Comments at 6. See also TRW Comments at 16 n.24. Nor has AMSC committed to any particular modulation technique. Such vagueness in AMSC's plans raises further questions as to its ability to put this spectrum to productive use.

AMSC also raises the specter of warehousing the spectrum by the LEO MSS applicants. See AMSC Comments at 32. Again, it is AMSC's proposal that raises the most obvious risk of leaving valuable spectrum unused. In addition to its exclusive authority to operate in 30 MHz in the upper L-band, AMSC has

applied to use an additional 28 MHz in the lower L-band (1530-1544/1631.5-1645.5 MHz). As stated above, AMSC's affiliate Personal Communications Satellite Corporation has also recently applied to operate in another 40 MHz in the 2 GHz band.^{6/} If countenanced by the Commission, such band shopping could inevitably result in the warehousing of a vast inventory of spectrum.

5. The LEO MSS Architecture is an Emerging Technology That the Commission Should Encourage

As Motorola pointed out in its initial comments, the requirement of a LEO architecture is also justified on the basis of the status of the LEO systems as an emerging technology that the Commission is required to encourage. Section 7 of the Communications Act makes it the policy of the United States "to encourage the provision of new technologies and services to the public," and requires the Commission expeditiously to determine "whether any new technology or service proposed in a petition or application is in the public interest. . . ." 47 U.S.C. § 157.

AMSC questions the status of the LEO systems as an emerging technology on the ground that the Commission declined in an interim decision to grant any LEO applicant a pioneer's preference.^{7/} Of course, the only issue posed by these

^{6/} See Application for Authority to Construct a Domestic Communications Satellite System for the Provision of Mobile Satellite Service, File Nos. 24-DSS-P-94 and 25-DSS-P-94 (filed Apr. 7, 1994).

^{7/} See AMSC Comments at 26 (citing Notice of Proposed Rulemaking and Tentative Decision, 7 FCC Rcd. 6414, 6419-22 (continued...))

pioneer's preference applications was whether the individual system proposed by each LEO proponent qualified for a preference, not whether the LEO technology and global MSS are a new technology and service requiring the Commission's encouragement under the Communications Act. See 1992 NPRM and Tentative Decision, 7 FCC Rcd. at 6419-22.

In the NPRM, the Commission has tentatively concluded that the LEO applications reflect a "new commercial technology" falling within the scope of Section 7 of the Act. The Commission found that these applications "represent the world's first commercial voice-capable LEO mobile satellite proposal and, we believe, have the potential to contribute to the domestic and international public interest in manners in which a GSO system may not." NPRM ¶ 20. Accordingly, upon adoption of these conclusions, the Commission is required by the Communications Act to promote such emerging technologies.

6. Geostationary Systems Operating in the MSS Bands Would Interfere with LEO MSS Systems and Inhibit Full Use of the Available Spectrum

As the Commission has recognized, "sharing of the RDSS bands by LEO and geostationary systems may require severe limits

2/ (...continued)

¶¶ 33-51 (1992) ("1992 NPRM and Tentative Decision"). Motorola has requested reconsideration of this tentative decision as applied to the IRIDIUM® system. See Amendment of Section 2.106 of the Commission's Rules to Allocate the 1610-1626.5 MHz and the 2483.5-2500 MHz Bands for Use by the Mobile-Satellite Service, Including Non-Geostationary Satellites, ET Docket No. 92-28, Comments of Motorola Satellite Communications, Inc. (filed Dec. 4, 1992).

on power and frequency that render both systems unworkable." 1992 NPRM and Tentative Decision, 7 FCC Rcd. at 6416 ¶ 17. The Commission has subsequently acknowledged that sharing between LEO and GSO systems is possible only if it is limited to frequencies not used for bi-directional operations, the MSS operations are subject to sharing constraints, and GSO and LEO systems use the same access techniques. Allocation Report and Order, 9 FCC Rcd. 536, 539 (1994). Even if AMSC modifies its proposal to use CDMA modulation, the inevitable power requirements of transmissions to a satellite at a distance of 22,000 miles, rather than a few hundred miles, will necessitate the imposition of sharing constraints that will unduly inhibit LEO operations.^{8/}

7. Any Benefits From the Operation of AMSC's System Will Still Fully Inure to the Public

The requirement of a LEO architecture and disqualification of geostationary systems in these MSS bands will not result in the forfeiture of any benefits to the public, consumers or the U.S. economy. AMSC claims that "over the next seven years, the development of AMSC's system alone will provide an average of over 2000 jobs a year for U.S. workers -- building the space and ground segment and marketing the service" AMSC

^{8/} The approximate peak receive gains of the antenna beams of AMSC's current design and that of LQP's Globalstar are 30 dB and 15 dB, respectively. The relative path loss from Earth to the two orbits is $(36,000/1,800)^2$, or 26 dB. A mobile terminal using CDMA would require 10 times more power to operate with the GSO than with the LEO system. Therefore, each of the channels of the GSO system would take the place of 10 channels in the LEO system, assuming they were operating on a co-frequency, co-coverage basis.

Comments at 4-5. See also Exhibit A to AMSC Comments. Even if the benefits to the U.S. economy claimed by AMSC are realistic, they will arise from the construction of the AMSC system and its operation in the upper L-band and will therefore not be affected even if AMSC's system does not meet the Commission's technical qualifications for use of the MSS bands under consideration in this proceeding.

In addition to those claimed benefits from AMSC's use of the upper L-band, the public will enjoy the much more substantial benefits promised for the U.S. economy by the uninhibited operation of LEO systems in the Big LEO MSS bands. As demonstrated by the May 4, 1994 report of Nathan Associates, Inc. (attached as Appendix 3 to Motorola's initial Comments), the IRIDIUM® system alone will create nearly 241,000 job-years through 2002. Of course, the other Big LEO systems should create tens of thousands of additional jobs.

Similarly, the disqualification of geostationary systems from these MSS bands will not deprive U.S. consumers of any service, since AMSC's geostationary system will still make its services available to U.S. consumers in the upper L-band. This makes pointless AMSC's request that the Commission "should permit the market to determine which technology -- GSO or non-GSO -- is superior." AMSC Comments at 20 n.24. The assignment of 30 MHz to AMSC in the upper L-band will give it every opportunity to compete with the proposed LEO MSS systems, and will indeed permit the market to decide which architecture is superior. See also TRW Comments at 15-16.

8. AMSC's Stale Criticisms of LEO Systems Are Unfounded

AMSC casts a barrage of criticisms against LEO MSS systems, all of which it has previously made in other related proceedings.^{2/} All of these criticisms have been repeatedly rebutted by Motorola and others.^{10/} For the most part, AMSC's comments are irrelevant to the issues raised in this proceeding.

For example, AMSC's charges regarding alleged inefficiencies of LEO systems are unfounded. LEO systems proposing to serve the entire globe do not waste spectrum resources and satellite power. By projecting satellite beams over the entire globe, such systems will be able to offer MSS both to densely and to sparsely populated regions. Systems such as the IRIDIUM® system will also conserve power by managing beams and shutting them off over the poles and oceans, as well as

^{2/} See, e.g., In the Matter of the Applications of Ellipsat Corporation, Motorola Satellite Communications, Inc., File Nos. 11-DSS-P-91(6), 9-DSS-P-91(87), CSS-91-010, American Mobile Satellite Corporation, American Mobile Satellite Corporation's Petition to Deny (June 3, 1991), Reply Comments (Jul. 3, 1991), Response (Aug. 5, 1991); In re Applications of Constellation Communications, Inc., Ellipsat Corporation, Loral Qualcomm Satellite Services, TRW Inc., File Nos. 17/18/19/20-DSS-P-91, American Mobile Satellite Corporation's Petition to Deny (Dec. 18, 1991), Consolidated Reply (Mar. 27, 1992).

^{10/} Motorola Satellite Communications, Inc., File Nos. 9-DSS-P-91(87), CSS-91-010, Consolidated Opposition and Reply of Motorola Satellite Communications, Inc. (Jul. 3, 1991), pp. 34-38. Applications of Constellation Communications, Inc. For Authority to Construct a Low Earth Orbit Satellite System in the 1610-1626.5 MHz and 2483.5-2500 MHz Bands, File Nos. 17-DSS-P-91(48), CSS-91-013, Opposition and Reply Comments of Constellation Communications, Inc. (Jan. 31, 1992) Ellipsat Corporation Application for Authority to Construct and Operate an Elliptical Orbit Satellite System in the 1610-1626.5 and 2483.5-2500 MHz Bands, File No. 18-DSS-P-91(18) Opposition of Ellipsat Corporation to Petitions and Reply to Comments (Jan. 31, 1992).

through bi-directional operations and employment of other power management techniques.

While AMSC admits the inherently poor quality of GSO satellite service to handheld terminals, it attempts to mitigate that debilitating weakness by questioning the ability of LEO systems to serve handheld devices. Motorola has amply demonstrated that the link margins of the IRIDIUM® system are sufficient to provide high quality, uninterrupted voice and data services in virtually all environments, including areas shadowed by foliage, ground clutter and other obstacles. The IRIDIUM® system has been designed to provide service to handheld terminals located inside moving vehicles without any vehicular mounted antennas. AMSC itself acknowledges that Motorola's IRIDIUM® system "exhibits the capability for adequate power to serve handheld terminals in many areas," and that it "appears capable of providing an 18 dB margin . . . for service to vehicles or more favorably located handheld terminals." Technical Appendix to AMSC Comments at 1, 2. According to the ITU-R studies cited by AMSC, such link margins plainly allow for service to handheld terminals located in urban/suburban areas and in vehicles. See id.

B. The Commission Should Not Relax the Requirements of Global and Continuous U.S. Service

Virtually all commenters are in essential agreement with the need for a requirement of global and continuous U.S. service. Certain parties, however, recommend a relaxation of the requirements proposed by the Commission. TRW, Ellipsat and

Constellation protest that the global service requirement, as proposed, will obligate LEO systems to provide service to areas of the world "for which there is not now, and may never be, actual demand." TRW Comments at 27; see also Ellipsat Comments at 30-31; Constellation Comments at 38. To avoid such an obligation, TRW and Constellation maintain that the Commission should only require the capability of global coverage at a minimum elevation angle of 5° and not the offering of actual MSS service. Ellipsat recommends that the Commission's proposed limits to the global service requirement be relaxed from 80° southern and northern latitudes to 55° southern and 75° northern latitudes. Constellation suggests 65° as the maximum latitude for both hemispheres.

Motorola cannot agree with any of these suggested changes to the Commission's global service standard. First, as Motorola has pointed out in its initial Comments, a mere requirement of geometric "coverage" is meaningless if not coupled with the actual capability of providing MSS. The Commission should be concerned with "service," not physics. If an MSS subscriber travels to a location that is geometrically visible from an MSS satellite at a 5° elevation angle, this visibility might satisfy the coverage requirement recommended by TRW and Constellation, but would be of no benefit whatsoever if the subscriber cannot actually use the terminal unit to transmit and receive MSS communications. Furthermore, TRW's suggested formulation of the global coverage requirement could allow cherry-picking of the world's most densely populated and most

affluent areas at the expense of less populated regions. This would defeat the Commission's vision of global LEO MSS available to both developed and developing countries. It would also establish a bad precedent in the context of the U.S. need to coordinate these systems with other countries.

Indeed, the need for MSS may well be most acute in sparsely populated or unpopulated areas. In light of the mobile nature of the service, LEO MSS systems will be beneficial to travelers, explorers and rescue workers as well as to indigenous populations. For example, MSS would be very valuable to the scientific community (about 4,000 people from forty countries, including the U.S.) stationed in Antarctica for part of the year, as well as to U.S. military installations at above 75° northern latitudes (including Thule, Greenland and the DEW line in Northern Canada). Also, relaxation of the requirement would mean that aeronautical mobile satellite (R) service ("AMSS(R)") would not be available to passengers on transoceanic flights, which routinely follow Great Circle routes over polar/near polar regions. Thus, confining the service requirement to the latitudes suggested by Ellipsat and Constellation would fail to maximize the benefits from this new service.^{11/}

^{11/} As Motorola recommended in its initial Comments, see Motorola Comments at 19-20, to safeguard the usefulness of the global service requirement the Commission should also require the applicants to certify that they will make provision for the ground segment infrastructure necessary to effectuate this requirement. With respect to ground segment infrastructure, Motorola wishes to modify the language of rule 25.143(b)(2)(iii) that it had proposed in its initial Comments to avoid any compromising of global service. Each applicant should be required to certify

(continued...)

Ellipsat also recommends that the Commission substitute a uniform 15° minimum elevation angle for the 5° minimum angle proposed in the NPRM. While such an angle might be the minimum elevation angle from which Ellipsat's system can provide useful service, other systems, such as the IRIDIUM® system, will be able to provide high-quality service at much lower elevation angles. Ellipsat does not explain why the Commission should impose on all the MSS systems the minimum angle required by the design of a single system, when other systems can provide service at lower elevation angles. As Ellipsat itself argues, the Commission should not get embroiled "in scrutinizing and passing judgment on specific system designs." Ellipsat Comments at 30. Instead, as Motorola has recommended, the Commission should require that each point of the globe be able to receive service from at least one satellite at the minimum angle required by the design of that system for the provision of service, so long as this angle is at least 5°.

Motorola also disagrees with TRW's request that the U.S. continuous service requirement not extend to Puerto Rico, the U.S. Virgin Islands or other U.S. territories. See TRW Comments at 33. Such an exception would unfairly discriminate against the U.S. citizens in those off-shore areas, whose need

^{11/} (...continued)

that it shall establish, or arrange for the establishment of, the ground segment infrastructure necessary to permit provision of Mobile Satellite Service to at least 75% of the surface and population of the world within six years of the grant of its space station license.

for satellite-based mobile services may be even more pressing than on the U.S. mainland. As TRW correctly recognizes, "a threshold standard of universal coverage is necessary in order to realize the full benefits of non-geostationary operation." TRW Comments at 26. The Commission should not risk compromising those benefits by relaxing its proposed standards, especially since both TRW and Ellipsat claim that their systems can easily meet them without any moderation. See TRW Comments at 27; Ellipsat Comments at 30, 32.

C. Any Spectrum Efficiency Standards Must be Expressed on a Per-Unit-of-Spectrum Basis

Motorola has refrained from recommending specific spectrum efficiency requirements at this juncture. See Motorola Comments at 53 n.39. However, if the Commission decides to promulgate such requirements as recommended by LQP, it should not establish a specific number of channels as a minimum without reference to the amount of spectrum to be assigned to each applicant. The minimum proposed by LQP -- 1500 voice channels -- is an absolute number that would apply regardless of the total amount of spectrum to be used by any applicant, and would therefore fail to gauge that applicant's efficiency in using the assigned spectrum. See LQP Comments at 23-24. A more equitable and accurate measure of efficiency would be provided by enunciating a minimum number of channels for each MegaHertz of user link spectrum to be employed by each applicant.